- Modern X*ray Technique- Prepared by Dr Fred Baier-St Louis Mo

Legg Perthe's Disease
(Osteochondritis Deformans Juvenilis)

I Definition-Chronic necrosing destruction of the developing femoral head. Usually unilateral.

II-Sex Incidence- Boys are more commonly affected.

III-Age-Three to twelve years, most cases occur between six and eight years.

IV-Etiology-A-Traumatic

I-Any injury altering the anatomy of the hip joint. (Dislocation or fracture)

2-Slipped capital ephipysis.

B-Infection

I-Foci of infection by metastisis to epiphysis of femur (teeth, tonsils, sinuses)

V-Symptoms- I-Characteristic limp on affected side.

2-Mild pain may be ~~present in~~ present in hip joint.

3-Referred pain in knee

4-Normal flexion.

5-Limited abduction and rotation.

6-Prominent greater trochanter.

VI* Prognosis- A-Usually good if proper early treatment is given.

B-Residual deformity of the femoral head and neck may result if improperly treated or if discovered during late stage.

VII-X-ray Findings A-Acute Stage

I-Flattening of femoral head.

2-Fragmentation of femoral head due to necosis.

3-Broadening of neck of femur.

4-Irregular or arrested development of acetabulum due to non-supporting pressure of femoral head.

B-Healed Stage

I-Residual Deformity

a. Mushrooming of head of femur. May extend beyond lateral brim of acetabulum.

b-Shortening and broading of femoral neck

c-Tendency to arthritis in later years.

VIII Treatment-Approx. one year.

I-Immobilization

a. Plaster cast.

b. Extension with traction

c-Pin through distal end of femur with traction.

d-Improve general health (calcium, etc)

Slipped Capital Femoral Epiphysis

I

I-Definition-Dislocation or separation of upper femoral epiphysis. (unilateral or bilateral)

II-Sex Incident-Boys more commonly affected than girls.

III-Age-Ten to fifteen years.

IV-Etiology-A-Frolich's Syndrone.

B-Obesity

C-Traumatic

V-Symptoms- I-Pain if traumatic

2-Impaired locomotion

VI-Prognosis-Good if properly treated.

VII* X-ray findings.

I-Similar to fracture of femoral neck.

2-Superior displacement of neck of femur (coxa vara deformity)

3-Femoral head remains in acetabulum.

VIII-Treatment-I-Closed reduction with traction.

2-Open reduction may be necessary.

3-Glandular therapy if pituitary insufficiency present (See Frohlich's Syndrome)

Otto's Disease (Intrapelvic Protrusion of the Acetabulum)

I-Definition. Unilateral or bilateral protrusion of the mesial acetabular wall into the pelvic cavity

II-Sex Incidence. Found chiefly in women past 25 years of age.

III-Etiology A. Arthritis.

B. Pyogenic infection

c. Calcium deficiency

IV-Symptoms- I-Impaired locomotion

2-Limited abduction and rotation

3-Pain if arthritis is active.

V-Prognosis-Unfavorable regarding restoration of joint.

VI-X-ray Findings-I Intrapelvic protrusion and deepening of the mesial portion of the acetabulum.

2-Lipping of articular margins of acetabulum.

3-Flattening of weight bearing portion of femoral head.

VIII Treatment-Correct cause

Degenerative Joint Disease

I-Definition. Degenerative changes in one or both hip joints with absorption of articular cartilages ~~ande position~~ and bone changes.

II-Sex-Both,

III-Age- Usually past thirty years.

IV-Etiology Conditions which may alter the anatomy of the hip joint.

I-Fracture of femoral head or neck

2-Fracture in acetabulum

3-Dislocation of femoral head or congenital subluxations.

4-Slipped capital femoral epiphysis

5-Untreated or improperly treated Legg-Perthe's Disease.

6-Circulatory disturbances.

7-Foci of infection

V-Symptoms- I-Pain

2-Impaired function

a-Limited abduction, adduction, flexion, extension and rotation.

VI-Roentgen Findings

I-Erosion of articular cartilage.

2-Loss of interarticular space

3-Cystic degeneration of marrow of femoral head.

4-Flattening and mushrooming of head of femur.

5-Exostosis of acetabulum and femoral head.

6-Aseptic necrosis of femoral head

7-Ankylosis.

VII-Treatment. I-Unsatisfactory

2-Surgery

Loss of Normal Lordosis of Cervical Spine

I-Etiology I-Trauma

a-Ruptured disks

b-Fractures

c-Dislocations

d-Ligamentous

II-Torticollis

III-Arthritis

IV-Reflex muscle spasm

II-Symptoms-I-Headache

a-Occipital

b- Supraorbital, unilateral or bilateral.

2-Onset affected by posture

a-Abnormal position of head (driving car, sleeping)

3-Pain elicited lateral to second cervical vertebra by palpation.

III Roentgen Findings

I-Loss of lordotic curve.

2-cervical spine quite straight

IV-Treatment I-Manipulation

aTraction

2-Pillow under shoulders in supine position.

Brachial Plexus Compression
(Scalenus Anticus Syndrome)

I-Definition-Scalenus neurocirculatory compression affecting brachial plexus and producing a complexity of symptoms.

II-Etiology-I Cervical rib

2-Elevation of first rib due to contraction of scalenus anticus and scalenus medius muscles.

3-Abnormal position of shoulder

a-Hod carriers, solders, etc.

4-Trauma or toxins producing spasms of scalenus muscle.

III-Mechanism-Spasm or contraction of scalenus anticus and medius muscles compresses lower trunks of brachial plexus and subclavian artery. Angle between scalenus anticus and first rib is decreased.

IV-Symptoms. Paraesthesia.

a-Pain may extend from cervical, scapular and pectoral regions to hand and fingers on affected side.

b-Pain and numbness, elbow, neck shoulders etc.

c-Pain may be induced during sleeping hours.

d-Tenderness over supraclavicular region.

V-Roentgen Findings-Elevation of first rib on affected side.

VI-Treatment-

I-Surgical

a-Division of scalenus anticus near rib insertion.

b-Dorsal sympathectomy.

c-Procaine hydrochloride injection.

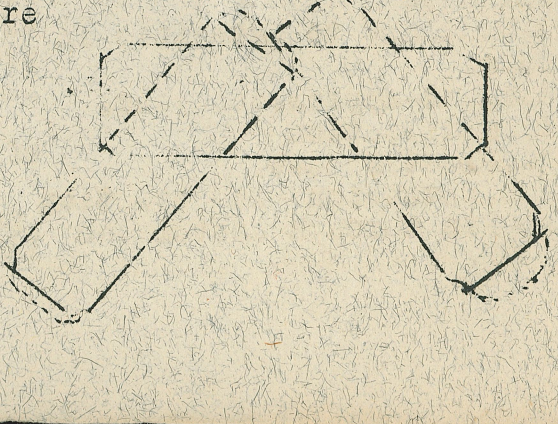
II-Non-surgical (mechanical)

a-Elevate shoulder on affected side (sling, taping, etc.)

b-Arrange three pillows-diagram

c-Sleeping with arms above head

d-Heat and manipulate.



Spontaneous Pneumothorax-

I-Definition. Sudden complete or partial collapse of one lung.

II-Sex-Both, more common in males.

III-Age. Usually between 20 and 40 years of age (average 24).

IV-Etiology RuptureeOf a valve vesicle or bleb located near pleural surface of lung.

V-Predisposing Factors.

I-Emphysema.

2-Healing or active tuberculous lesions.

3-Scar tissue.

4-Congenital valve vesicle.

VI- Mechanism-

I-Vesicle or bleb situated at a terminal bronchiole near pleura.

2-Valve or flap-like structure at base.

3-Air enters vesicle, valve or flap prevents air from escaping.

4-Vesicle gradually enlarges due to positive pressure built up by respiration.

5-Walls weaken due to dilation and eventually rupture, air escapes into pleural cavity.

VII-Direct Cause of Rupture.

I-Violent exercise.

2-Lifting heavy objects.

3-Severe coughing or sneezing.

4-Straining at stool.

5-Assuming awkward or unusual positions.

VIII-Symptoms.

I-Onset abrupt.

a.Pain in chest on affected side.

b.Dyspnea.

c.Accelerated pulse.

d-Absence of temperature.

e.Bulging of intercostal spaces on affected side.

IX-Prognosis.

I-Usually good.

2 Re-expansion occurs from ten days to four weeks.

X-Treatment-

~~SXXXXxxxxxxxPxxxxxxthoxax.~~

I-Bed rest or limited activity.

2-Refrain from the following.

A-Awkward positions.

b-Straining at stool.

c-Lifting heavy objects.

d-Severe coughing.

e Going up in airplane

f-Aspiration of air

g-If recurrent and persistent, chemical pleuritis to obliterate pleural space advised.

3-Check chest with x-ray at frequent intervals to determine re-expansion.

XI-Complications.

I-Bilateral collapse.

2-Tuberculosis.

3-emphysema.

4-Cardiac displacement to affected side.

5-Pleural effusion.

6-May become chronic or persistent

Pathology of Mediastinum.

A-Lymphosarcoma.

I-Definition. A neoplastic growth arising in the mediastinum. Usually primary. Age 30-50 years. Sex Both.

II-Symptoms.

I-Pain, pressure or burning sensation.

2-Respiratory Disturbances.

3-Dysphagia.

III- Roentgen Findings.

I- Asymmetrical enlargement of mediastinum. (lobulated protrusion into lung fields)

2-Symetrical enlargement of superior mediastinum.

IV- Treatment .Unsatisfactory.

B-Hodgkin's Disease of Mediastinal Lymph Nodes.

I-General widening of mediastinal shadow.

2-Extends superiorly to neck.

3-Borders appear straight.

C-Aortic Arch Aneurism.

I-Definition. Normal aortic arch replaced by widened prominence. Extends into left lung field. Pulsation discernible during flureoscopy.

II-Etiology. Approximately 85% Luetic. Congenital.

III-Complications.

Erosion of sternum or spine. Rupture.

IV- Treatment. Anti-Luetic.

Cardiospasm-

I-Definition-Idiopathic dilatation of the oesophagus due to spastic contraction of the cardiac orifice.

IISex Incidente. More prevalent in females.

III- Age-I-May begin at any age.

2-Usually past forty.

IV- Etiology. Idiopathic- No known Cause.

V-Symptoms I-Dysphagia.
2-Gastric distress.
3-Eructation of decomposed food.

VI*Roentgen Findings.
I-Diffuse enlargement of oesophagus.
2-Progressive dilatation.
3-Increase of lumen in distal portion of oesophagus extending upward.
4-Oesophagus becomes lengthened as condition progresses.
5-Redundancy of distal portion of oesophagus occurs due to lengthening and may produce an S- shaped configuration.
6-Pronounced distention of lower half of oesophagus.
7-Walls become hypertrophied and thickened.
8-Oesophageal walls become flaccid with resultant minimal peristalic waves.

VII- Treatment.
I-Semi-solid or liquid diet.
2- Mechanical dilation of constricted portion.

Outline of Dark Room Technique and Class Discussions by Ray Horn.
Buck Xograph Co. Class at Marshall
History of X-ray and discovery-
Date-November 8th.,1895.
Place- University of Wurzberg Bavaria
By whom? Wm. Conrad Roentgen.
Leading a group of scientists in the research of trying to pass an electrical current through a vacuum tube covered with black cardboard he noticed it caused a card board near the tube to flureence.The card board had been coated with a solution of Barium Platinocyanide. Fluoroscopic screens coated with (zn.Sulphide)Intensifying screens coated with Calcium Tungstate.)
Care of the Patient and Preparation
Consider the feeling and welfare of the patient above everything.
They are sick or injured and highly nervous.(Be Gentle)(Be business like)(Talk easy but not mushy)
Work out a carefully planned routine and practice it,such as making the exposure,taking measurement,setting machine and positioning.Remove all silk,rayon,metalsuch as buckles, pins(hairpins) Avoid gossip about other patients.Do not use terms -terms the patient does not understand.Patient must realize this is routine with you.

Darkroom Planning(processing room)
Petsing says,The Darkroom is The Keystone to Coordinated Efforts and the Expeditious Handling of the X-ray Film from Loading Cassette to Interpretation. Others say from 75 to 90% of success or failure is in -the darkroom.Size and design-cannot be cramped.Tank at one end, -loading bench at other(wet side -and dry side to every darkroom.) Must be light proof-color should never be black,pale yellow,green the desired color.Dull or semi-gloss. Bottom half of room may be grey, acid and alkaline resisting paint. Atmospheric Condition-Drey,never -in basement if possible.
Well ventilated- Odors such as developing chemicals,acetone,formaldehyde and penetrating odors will fog film.Consider condition and size of tank,loading bench,darkroom lamp (bulb never larger than IO Watt)
Processing The Film-(Six chemical changes in processing of film)
I.Exposure 2.Developing.3.Rinsing.
4-Fixing-5.Washing-&_Drying.
Enter darkroom-turn on white light-lock door-clear loading bench and -tank-stir solution-check temp. -select hanger-turn on safe light-turn off white light.Carefully -remove film from cassette. -Fasten film in hanger-into devel-Oper for required time and agitate Slowly raise film from developer. Rinse vigorously 20 to 30 seconds and place in fixer.Agitate film. Fix three times as long as you develope.Wash in running water at least 20 minutes.Allow filmto dry in drying rack. Always clip corners of film before filing.Always use film filing envelopes.

A Few Don'ts
I-Don't guess at processing time
2-Don't keep film or cassette lying flat.3.Don't bend or crease -film.4-Don't stir solutions with same paddle.5-Don8t remove film too rapidly from developer.
6-Don't transfer film from developer to fixer without rinsing at least I5 seconds. 7-Don't guess at washing time 8-Don't process film in solutions below 62 or 75 degree f.

Ans- There is for any voltage a corresponding range of wave-lengths in the X-ray beam. As the voltageis increased rays of shorter wavelengths are progressively added.

Why is the vacuum tube more satisfactory to use in general radiographic work?

Ans-I-With the vacuum tube, the electron emission, and hence the currentethrough the tube, may be controlled easily and accurately by regulating the temperature of the cathode filament.

2-Because of the fact that the current through the vacuum tube may be held constant at any desired value, the potential applied to the tube, and hence the quality of the x-rays delivered by the tube, may be accurately controlled.

3-Accurate control of both quantity and quality of the x*rays delivered by the vacuum tube permit of exact duplication of radiographic results.

-Of what metal is the anode of the vacuum tube made?

Ans-Tungsten.

-Why is tungsten used?

Ans-Because of its high melting point, which permits the delivery of a large amount of X-ray energy for a short time, or a small amount over a long period of time.

-Can the tungsten anode of the vacuum tube be allowed to become white hot?

Ans-Yes.

-How is the heat from a hot vacuum tube anode disposed of?

It is radiated out through the glass walls of the tube.

-For what class of X-ray work is the vacuum anode especially suitable, with its high melting point and greater carrying capacity?

Ans- X-ray therapy.

-What metal supports the vacuum tungsten anode in positionm?

Ans-Molydenum.

-Why is molydenum used?

Ans-Because it can be more easily machined and has, under certain conditions, greater mechanical strength than tungsten.

-What metals are used in the construction of the anode of the radiator tube?

Ans- A tungsten button is cast in to a block of copper.

-Why is copper used?

Ans-Because copper permits rapid removal of heat from the focal spot.

-In what way does the construction of the anode of the radiator tube affect the size of the focal spot?

Ans- It allows the use of smaller focal spots for given amounts of X-ray energy.

-For what class of X-ray work is the radiator tube most suitable?

Ans- General radiographic work.

-What is meant by the focal spot?

-AnsThe focal spot is that area of the anode or target which is ~~com~~ bombarded by the electron stream when the tube is in action.

-What effect does the size of the fe-focal spot have on a radiograph?

-Ans-All other factors being equal, the smaller the size of the focal spot the finer the definition.

-What governs the size of the focal spot?

Ans-The shape of the filament, its position in the focusing devise, and the distance between anode and cathode.

-Is the density of a radiograph affected by the size of the focal spot?

Ans-Not so long as all other factors remain equal.

-Of what does the cathode consist?

Ans-A spiral filament of tungsten wire placed within a molybdenum cylinder or cup for focusing the electron stream.

- Why is the cathode of the radiator tube bent downward?

Ans-This is done for the purpose of properly directing the electron stream towards the center of the tungsten button or target.

*Why is tungsten used for cathode?

Ans-I-Because of its high atomic number, giving relatively high efficiency of X-ray production.

2-Because of its high melting ~~po~~ point.

-Note- Rotating anode tubes are now in use. By rotating the anode we can have a very fine focal spot while using a high K. V. and M.A. factors thereby gaining great detail with higher speed.

9-Don't crowd film during processing,allow I inch space.I0.Don't leave solutions uncovered when not in use.

Second Lecture By Ray Horn at Hotell President K.C. Mo.

I-Subject
  A-Intensifying Screens.
    I-How manufactured.
    2-What it consists
    3-Its purpose.
    4-Screen troubles,dirt,strain, lag,speed(cause & test for each)
    5-Screen care.
2-The cleaning of the darkroom after summer months.
3-Practical study of film complaints.
  A.Type of film used in study.
    I-Process film with corners not clipped.
    2-Fog from safelight.
    3-Underdeveloped film.
    4-Overdeveloped film.
    5-Light under door.
    6-Under fixed film.
    7-Light fog around door and keyhole-8-Blotch from improper spacing of the film.-9- Mold static.
    I0-Christmas tree static.
    II-Static from nail,crinkle marks.
    I2-Too high K.V.(fog)
    I3-Too low K.V.(chalky appearing)
    I4-Age fog on film.
    I5-Poor screen contact,test& cure.
    I6-Hyperacidity of fixer.
    I7-Developer too low.
    I8-Hypo too low.
    I9-Chemical stain of film.
    20-Damp interlayer paper.
    21-Over exposed film.
    22-Under exposed film.
    23-X-ray fog throu darkroom wall.
    24-Marks on film from dirty screens
    25- Improper washing between developer and fixer.
    26-Improper washing after fixing
    27- Solution too hot.
    28-Hot developer and cold water bath.
    29-Air bubbles-caused by not agitating the film in solutions.

X-ray Questions Submitted by Harmon Russell Representative of The H.G. Fischer X-ray Co.

1-Describe the operation of an X-ray tube?

ans-I-The cathode filament is heated and emits electrons in proportion to its temperature.

(2)-High potential is applied to the terminals of the tube, A stream of electrons is thus made to travel toward the face of the anode at a speed determined by the potential applied.The stream of electrons is brought to a focus at a spot on the anode,the size of which is determined by the design of the cathode and anode and their positions in the tube.

3)-The sudden stopping of the electron stream at the anode results in the production of X-rays which are radiated in all directions from the focal spot. The beam of X-rays produced is a composite beam made up of many wave-lengths. X-rays of shorter wave lengths are progressively added as the potential applied to the tube is increased.

What is meant by direct radiation from a tube?

Ans-That radiation which emanates from the focal spot.

What is secondary radiation?

Ans-Second radiation is the X-radiation emitted by any substance through which X-rays are passing.

What is meant by stray radiation?

Ans. Stray radiation is that radiation which emanates from parts of the tube other than the focal spot.

How may stray radiation be demonstrated?

Ans-By exposing sufficiently long, through a pin hole,as in making a pin hole camera picture of the focal spot,an image of all parts of the tube emitting X-rays may be obtained.

What is meant by ''soft and ''hard radiation?

Ans-Soft radiation is radiation of long wave-length and results from using low voltages.Hard radiation is that of shorter wave-length and results from the use of high voltages.

In what ways do X-rays differ from ordinary light?

Ans-They are of much shorter wave length.

Does the wave-length of the X-ray vary with variation of the voltage applied to the tube?

What is meant by time factor?

Ans-The time factor refers to the time of exposure.

How is the time factor usually measured?

Ans-By seconds.

What is the usual time used for aradiograph of the human body?

Ans-It varies from I/20 of a sec. to 60 seconds.

-Why are short time exposures necessary?

Ans- Inorder to over come effects of movement due to respiration, heart action and peristalsis,also for infants and restless children, as well as adults who cannot or will not remain stationary for a longer time of exposure.

-When are longer exposure times used?

Ans- With smaller focal spot tubes where there is little or no danger of movement of the part exposed.

-Is there a standard fixed time of exposure for each part of the body?

Ans- No.Some use one time of exposure and others use another time of exposure for the same part. From I/20 toI second is commonly used for the heart, chest,gallbladder and gastro-intestinal work,also for children and nervous individuals,I to I0 seconds for extremity work,from 5 to 30 seconds for the usual Potter-Bucky Diaphragm work,from 5 to 30 seconds for frontal sinuses and mastoids.As much as 30 to 60 seconds may be used for lateral lumbar spines with patients weighing fro 200 to 350 pounds especially with a lower milliamperage(I0) is used with a Bucky.

- Does the machine used have any thing to do with the time of exposure?

Ans- Yes.The smaller machines do not provide sufficient energy for very short time exposures with heavy parts or large individuals.

I5 MA-75 KV--20MA-85KV--30Ma-90KV.

-What is the effect on the film of varying the time factor?

Ans-The short time is used for the purpose of avoiding any movement of the part exposed during time of exposure.

-The shorter time also results in less contrast due to the increased KvP required.The longer time results in greater contrast due to the lower KvP required for a given radiographic density.

-How does the altering of the time factor affect the radiographic density of the film,all other factors remaining the same?

Ans-The radiographic density of the film varies in direct proportion with the time of exposure.

Example-Doubling the time of exposure doubles the radiographic density ,halving the time of exposure halves the radiographic density,all other factors remaining the same.

-With what type of machine should ~~the~~ the time factor be altered to vary radiographic density?

Ans- The machine with a fixed KV -or a rheostat-controlled machine.

-Does varying the time factor --have any effect upon distortion?

Ans- No.

-Does varying the time factor have any effect on detail?

Ans- Varying the time factor does -not affect the detail except to -make detail more or less ---visible.

-Does altering the time factor have anything to do with the patient?

Ans-Yes.The time factor plays a very important part with the patient. Too long a time exposure may result in the removal of the hair of the part exposed ,or in a destruction o of the skin or even the deeper structures of the part exposed.

-Is a timer necessary?

-Ans- Yes,for exposures of one second or less.

-Why is a timer a necessity for short time exposures?

Ans-Because if the time factor cannot be duplicated ,the end-result (the film)cannot be duplicated.

-Fractional second time cannot be be duplicated without the use of some kind of a mechanical or electrical devise.When using a -fractional second exposure a variation of 50% might not be noticeable,yet it would result in a 50% variation of the radiographic density of the film.

-Is a time switch reliable?

Ans- Very dependable.

-What are the four prime factors used in operating X-ray equipment?

Ans Distance,time or exposure,KvP. is also referred to as penetration.

-What is meant as the distance factor?

Ans-The distance factor refers to the distance between the focal spot of the tube and the film.

-How is it measured?

Ans-Usually in inches.

-What is meant by focal -plate or focal film distance?

The distance between the focal spot of the tube and the plate or film.

-Is there a standard fixed focal-film distance for all parts of the human body?

Ans- No.Some operators use one distance and others another distance for the same part.from 60 to 72 inches is used for chest work, usually 72 inches for chest work, usually 72 inches for heart,30 in. for gastro-intestinal,36 inches for extremities,30 to60 inches for spinal work and30 to 36 inches for frontal sinuses and mastoids.

-Does the machine used have anything to do with the focal- film distance?

Ans-Yes.Greater distances can be used with the larger machines and shorter distances must be used with the smaller.The smaller machines cannot deliver sufficient energy for the greater distances.

-What is meant by focal-skin distance?

Ans-The distance between the focal spot of the tube and that part of the skin of the patient which is nearest the focal spot.

-What is the minimum focal-skin distance?

Ans- It is rarely necessary to use less than I5 inch focal skin distance except in dental X-ray.

-Does altering the distance factor have anything to do with thepatient.

Ans-Yes.Altering the distance factor plays a very important part with the patient.The shorter the focal skin distance the greater the danger of too much exposure to the patient. An increased focal skin distance means less danger to the patient.

- Does the tube used have anything to do with the focal-film distance?

-Ans-Yes.The larger focal spot ~~tube~~ es can be used for greater distances and the smaller focal spot tubes must be used for shorter distances.The small focal spot tube cannot deliver sufficient energy for the greater distances.

-What is the effect on the film of varying the distance factor?

Ans-With increased distance better detail and less distortion should result,especially with those parts which lie at a greater distance from the film.With decreased distance less energy is required and detail and distortion should be quite satisfactory,especially with those parts which lie quite close to the film.

-What classes of work are the greater distances used?

Ans- Especially for heart work, where the minimum of distortion is desired.Also for chest work where the minimum of distortion and the maximum of detail are desired.

-For what classes of work are the shorter distances used?

Ans-For extremity work,where the ~~pa~~ parts may be placed very close to the film.Also for the Potter-Bucky diaphragm work,where the consequently increased distortion doess -not prove to be a serious matter.

-The detail,when using the shorter distances,may be materially -increased by the use of smaller -spot tubes.

-How does the altering of the distance factor affect the radiographic density of the film,all other factors remaining the same.

Ans-The radiographic density varies inversely with the square of the distance,all other factors remaining the same.

Example-Doubling the distance gives only one fourth the density.

Halving the distance gives four times the density.

-Is it good practice to alter the distance factor in order to improve the radiographic density of the film?

Ans-No.Because the change in distance introduces variations in distortion and detail which would be undesirable.

-Note-Buckys now have30-36-48-60 inch focal film distances.

-What is meant by the milliampere factor?

Ans- The MA.factor refers to the number of MA used during the time of exposure.

-How is the MA factor measured?

Ans-By a milliamperemeter placed within the high tension or tube circuit.

-What range of milliamperage is usually employed in radiography of the human body?

Ans- From IO to 500 MA.

* Is there a standard fixed MA for each part of the human body.

Ans-No. Some pperators use one MA and others another for the same part.From IO to30 MA are generally used for extremity work and bucky work.From 60 to IOO MA are generally used for heart,chest,gall-bladder and gastro-intestinal work or with children,nervous individuals or in injuries where a very short time exposure is desirable.

-For what classes of work are the lower MA used?

Ans- For all bone work such as the extremities,the spine,pelvis,hip, shoulder and head,where immobilization may be obtained,for the required time of exposure.

-For what classes of work are the higher MA used?

Ans-For heart,chest,gall-bladder and gastro-intestinal work,where a short time of exposure is desirable.Also for children and nervous individuals ,or in injuries where the part cannot be immobilized for the longer exposures.

-Does the machine used have anything to do with the MA.?

Ans-Only as far as the capacity of the machine is involved.A 30 MA machine could not deliver from 50 to IOO MA.

-Is it good practice to alter the MA in order to improve the radiographic density of the film?

Ans-No.While this is done it is not common practise to do so.

-Does varying the MA factor have any tendency toward increasing or decreasing distortions?

Ans- No.

-Does varying the MA factor have any effect upon detail,all other factors remaining equal?

Ans-Varying the MA factor does not change the quality of detail except to make detail more or less visible.

-How does the altering of the MA factor affect the radiographic density of the film all other factors remaining equal?

Ans-The radiographic density of the film varies in direct proportion with the MA. used.

Example.Doubling the MA doubles the radiographic density,halving the MA -halves the radiographic density, -all other factors remaining the same.

-Is contrast in a film varied by a change of MA.?

Ans- Yes.Provided a variation in voltage is made to compensate for MA variation.The higher the MA and the lower the voltage the greater the contrast.

-How does a higher Ma affect the exposure time?

Ans- A higher MA permits the use of a shorter exposure time.

-How does varying the Ma affect the latitude?

Ans-The lower Ma ordinarily permits a greater latitude with the exposuretime,or the KvP.

-Does altering the Ma have anything to do with the patient?

Ans-Yes.The Ma factor plays a very important part with the patient. Too high a Ma may result in removal of the hair from the part exposed or in the destruction of the skin or even the deeper structures of the part exposed.

- What is meant by gap or voltage factor?

Ans-The kilovolt factor refers to the voltage supplied to the tube.

-What is meant by a kilovolt?

Ans-A kilovolt means I,000 volts.

-Why is the word kilovolt usually employed instead of the word volt.

Ans- Because the voltage required usually runs in the thousands and the custom is to say 60 kidovolts rather than 60,000 volts.

-Why is the word peak added to the word kilovolts?

Ans-Because the voltage may be measured as kilovolts root means square referring to the average voltage of the wave employed,or as a kilovolts peak referring to the peak ofhighest voltage of the wave employed. The kilovolts peak is always used in X-ray work.

-How may voltage supplied to the tube be measured?

Ans-By means of a sphere gap connected across the secondary wires leading to the tube.

-What are the usual kilovolts peak employed in radiography of the human body?

Ans-From 30 to 140 KvP.

-Could a standard fixed voltage be employed for radiographing all parts of the human body?

Ans-Not satisfactorily.

-How should the voltage factor be disposed of in the laboratory?

Ans-The voltage factor is used more frequentlyas the variable factor for the purpose of increasing or decresing the radiographic density.

-What is the effect on the film of varying the voltage factor?

Ans-With all other factors remaining equal the radiographic density of the film is increased as the ~~volta~~ voltage is increased and vice versa.

-For what classes of work are the lower voltages used?

Ans- More especially for extremities and longer time exposures.

-Forwhat classes of work are the higher voltages used?

Ans-More especially for short exposures with the heavier subjects.

-Does the machine used have anything to do with the voltage employed?

Ans- Only as far as the capacity of the machine is concerned,

-Does the tube used have any thing to do with the voltage employed?

Ans-Only as far as the capacity of the tube is concerned. Too high a voltage with too high a Ma for too long a time may result in a punctured tube.

-Does varying the voltage factor have any effect upon distortion?

Ans-No.

-Does varying the voltage factor have any effect upon detail?

Ans-Varying the voltage factor does not affect detail except to make detail more or less visible.

-What are the great contributing factors,acombination of which bring about the end-result,the radiograph?

Ans-Distortion,detail,contrast,and radiographic density.

-What is meant by distortion as applied to a radiograph?

Ans-The word distort means to twist,turn or pervert from the natural or true shape pf the object to be shown.As applied to a radiograph,it means the twisting, turning or perverting from the natural or true shape of the bone, organ or other structure which it may be desirable to show.

-What are the principal factors ~~caus~~ causing distortion?

Ans-The distance of the object to be radiographed from the film,the distance of the focal spot of the tube from the film,and the alignment of the object,film and focal spot.

-May there be different types pf distortions as applied to radiograph?

Ans-Yes,Distortion may be due to an increased size of the object to be shown.In other words,a magnification may result but retain the true shape.Distortion may also be of an irregular or twisted form, in which case the true shape of the object to be shown is not maintained.

-What is the cause of a magnified distortion?

Ans-Magnified distortion is brought about by by the distance of the object from the film,also by the distance of the focal spot of the tube from the film.The shorter the distance between the object and the ~~foc~~ film the less the distortion,also the greater the distance between the focal spot and the film the less the distortion.

-Can magnified distortion be entirely eliminated?

Ans-It can rarely be entirely eliminated,for the reason that the object can rarely be placed in direct contact with the film.When the object is some distance away from the film,it is not considered practical to increase the distance from the focal spot and the film to such an extent that no magnification would result.

-How does the screen contact affect detail?

Ans-If any part of the screen surface fails to make firm contact with the film surface, a marked blurring of detail will result in that portion of the film.

-Does the Ma factor affect control of detail?

Ans-No.

-Does the time factor affect the control of detail ?

Ans-No.

-Does the voltage factor affect the control of detail?

Ans- No.

-Does contrast affect the quality of detail?

Ans-Only as far as detail may be made more or less plainly visible.

-Does the quality or make of the film affect detail?

Ans-The quality or make of film at present available has little to do toward controlling detail.

-Has screen quality or make any effect on detail?

Ans-The coarser the grain of the screens and the higher the speed of the screens, the greater the loss of the resulting detail.

-Does the developing process in any way affect the detail?

Ans-Only as far as detail may be made more or less plainly visible.

-How may the best possible detail be obtained in making a radiograph?

Ans-By placing the object as close to the film as possible, the focal spot a reasonable distance away from the film, the object in a direct line between the focal spot and the center of the film, using the smallest size focal spot available, and by keeping the object, film and tube stationary during time of exposure. If it is desired to use screens, good screen contact must be maintained.

-What is meant by contrast as applied to a radiograph?

Ans-The percentage of difference between the extreme blacks and whites may be termed contrast.

-What factors are ordinarily used to control contrast?

Ans-The time factor, the Ma factor, the voltage factor, the screen factor, the Bucky factor, and the cone factor.

-In what way does the voltage factor control contrast?

Ans-As the voltage factor is increased, and the Ma or time factor correspondingly decreased, the contrast will be decreased, all other factors remaining equal. As the voltage factor is decreased and the Ma or time factor correspondingly increased, the contrast will be increased, all other factors remaining equal.

-In what way does the time factor control contrast?

Ans-As the time factor is increased and the voltage factor correspondingly decreased, the contrast will be increased, all other factors remaining equal. As the time factor is decreased and the voltage factor correspondingly increased, the contrast will be decreased, all other factors remaining equal.

-In what way does the Ma factor control contrast?

Ans-As the Ma factor is increased a and the KV factor correspondingly decreased, the contrast will be increased, all other factors remaining equal. As the Ma factor is decreased and the KV factor is increased, the contrast will be decreased, all other factors remaining equal.

-In what way do intensifying screens affect contrast?

Ans-The use of intensifying screens adds materially to the amount of contrast that may be obtained.

-In what way does the use of the Bucky, or of cones, affect contrast.

Ans By preventing a large % of secondary and stray radiation from reaching the film, the contrast is materially increased.

-Can the distance factor be used to control contrast?

Ans-The distance factor is not ordinarily used to control contrast, because it introduces changes in distortion and detail.

-Does altering the quality of detail affect contrast in any way?

Ans No.

-Does the quality or make of film affect contrast?

Ans-The quality or make of film does have something to do with the amount of contrast available, but this is not used to control contrast.

-Is magnified distortion detrimental to the end result, the radiograph?
Ans-It is not considered detrimental so long as the minimum of such distortions is maintained, in other words, a slight increase in size of the object to be shown is not detrimental.

-What is the cause of true distortion?
Ans-True distortion results from an improper alignment of the object the film and the focal spot.

-How may true distortion be reduced to the minimum?
Ans-By placing the object to be radiographed in a direct line between the focal spot and the center of the film.

-Can true distortion be entirely eliminated by proper alignment?
Ans-It may be almost entirely eliminated when the area to be shown is small, but when the area is large (when using a 14 by 17 film for instance) more or less true distortion may result near the outer margin.

-Is true distortion detrimental to the end result, the radiograph?
Ans-True distortion may be very detrimental or misleading if too great, consequently the minimum of true distortion should be constantly maintained.

-How may the minimum of distortion be obtained?
Ans- By placing the object as close to the film as possible, the focal spot a reasonable distance away from the film, and by placing the object directly in alignment between the focal spot and the center of the film, with tube and film parallel.

-What is meant by detail as applied to a radiograph?
Ans-When all the contour lines of objects show and when the lines of cancellous structure of bones are clean cut, sharp, and distinct, the detail is said to be good. When these lines are more or less hazy and indefinite, the detail is n not so good.

- What are some of the principal factors in controlling detail?
Ans-The same factors that control distortion, distance of the object from the film, distance of the focal spot from the film, and the alignment of the object, film, and focal spot, are important. In addition to these, the following factors are of equal importance. The size of the focal spot, movement of the object, film or tube during time of exposure, the use or non-use of screens, and, when the screens are u used, screen to film contact, and the use or non-use of the bucky diaphragm or cones.

-How does the distance between the object to be radiographed and the film affect the detail?
Ans-The closer the object is placed to the film, the finer and sharper the detail, the greater this distance the coarser, hazier and more indefinite the detail.

-How does the distance between the focal spot of the tube and the film affect the detail?
Ans-The shorter this distance, the c coarser, hazier and less definite the detail, the greater this distance up to a certain point, the sharper and finer the detail.

-How does the alignment of the object, the film and the focal spot affect the detail?
Ans-The improper alignment of the three will result in a distortion of the detail.

-How does the size of the focal spot affect the detail?
Ans-The finer the focal spot used, the finer and sharper the detail. The larger the focal spot, the coarser, hazier and less definite the detail.

-How does movement of the object, the film, affect the detail?
Ans-Even slight movement of either may result in a loss of detail. Any considerable movement of either will result in a total loss of detail.

-How do intensifying screens affect detail?
Ans-The use of screens result in a loss of detail, in other words, better detail can be obtained without the use of screens. Detail obtained from the use of screens may be more plainly visible, but will be less sharp and distinct.

-Does the developing process affect contrast?

Ans Thedeveloping solution may be so compounded and the time and temperature so manipulated,that contrast may be altered,butthis is not considered a practical way to control contrast.

-Is the maximum contrast that can be obtained essential?

AnsNo.It is only essential to produce enough contrast to show clearly the different areas of varying densities.

-What is meant by radiographic density as applied to radiograph?

Ans- The general tendency of the entire film toward a lighter or darker appearance.A radiograph of the chest may be made dark(greater density)or very light(lesser density)

-What degree of radiographic density is most desirable?

Ans-The degree of radiographic density cannot well be fixed as a permanent thing,because one may prefer a certain degree of density while another may prefer a lighter in the same area.The degree of radiographic density is largely a matter of individual preference.

-Is it necessary that the radiographic density of a certain region be fixed within narrow limits?

Ans- No.With most regions quite a wide range of density may be permissible and still retain diagnostic value.

-Can the radiographic density be altered without altering contrast?

Ans-Yes.Two radiographs of the same region may be made,one of greater density,and the other of less density,and yet the percentage of difference between the extreme blacks and whites may remain the same.

-What factors are used for the purpose of controlling radiographic density?

Ans-The time factor and KV factor are ordinarily used for this purpose.The developing time factor is also frequently used as a last resort in controlling density.

-How does altering the time factor affect the radiographic density?

Ans-Increasing the time factor increases the density,and decreasing the time factor decreases the density,all other factors remaining equal.

*When is it advisable to use the time factor to control radiographic density?

Ans-Whenever the KV factor cannot be brought under perfect control or when a tube is being used at or near its voltage capacity.

-How does altering the KV factor affect the radiographic density?

Ans-Increasing the KV factor increases the density and decreasing theKV decreses the density all other factors remaining equal.

-When is it advisable to use the KV factor to control radiographic density?

Ans-When a fine,evenly divided autotransformer control is available, when a short fixed time is essential in order to obviate movement of any kind,and when the required KV range is within the KV capacity ~~per~~) of the tube.

-Does altering the distance factor affect the radiographic density?

Ans-Yes,if all other factors remain equal,but because of the fact that the altering of the distance factor introduces changes in detail and distortion,this factor is not ordinarily used to control density.

-Does altering the Ma factor affect radiographic density?

Ans-Yes,all other factors remaining equal,but because of narrow Ma limits of the smaller focal spot tubes, this factor is not ordinarily used to control density.

-Is the make or quality of film used of any importance in the control of radiographic density?

Ans- No.Any desired density may be obtained with any of the films in ordinary use at the present time, provided they are in good workable condition.

--Does the use or non-use of intensifying screens affect the control of radiographic density?

Ans-Any desired density may be produced with or without the use of screens.

-Is the make or quality of intensifying screens used of any importance in the control of radiographic density?

-How does the screen contact affect detail?

Ans-If any part of the screen surface fails to make firm contact with the film surface, a marked blurring of detail will result in that portion of the film.

-Does the Ma factor affect control of detail?

Ans-No.

-Does the time factor affect the control of detail ?

Ans-No.

-Does the voltage factor affect the control of detail?

Ans- No.

-Does contrast affect the quality of detail?

Ans-Only as far as detail may be made more or less plainly visible.

-Does the quality or make of the film affect detail?

Ans-The quality or make of film at present available has little to do toward controlling detail.

-Has screen quality or make any effect on detail?

Ans-The coarser the grain of the screens and the higher the speed of the screens, the greater the loss of the resulting detail.

-Does the developing process in any way affect the detail?

Ans-Only as far as detail may be made more or less plainly visible.

-How may the best possible detail be obtained in making a radiograph?

Ans-By placing the object as close to the film as possible, the focal spot a reasonable distance away from the film, the object in a direct line between the focal spot and the center of the film, using the smallest size focal spot available, and by keeping the object, film and tube stationary during time of exposure. If it is desired to use screens, good screen contact must be maintained.

-What is meant by contrast as applied to a radiograph?

Ans-The percentage of difference between the extreme blacks and whites may be termed contrast.

-What factors are ordinarily used to control contrast?

Ans-The time factor, the Ma factor, the voltage factor, the screen factor, the Bucky factor, and the cone factor.

-In what way does the voltage factor control contrast?

Ans-As the voltage factor is increased, and the Ma or time factor correspondingly decreased, the contrast will be decreased, all other factors remaining equal. As the voltage factor is decreased and the Ma or time factor correspondingly increased, the contrast will be increased, all other factors remaining equal.

-In what way does the time factor control contrast?

Ans-As the time factor is increased and the voltage factor correspondingly decreased, the contrast will be increased, all other factors remaining equal. As the time factor is decreased and the voltage factor correspondingly increased, the contrast will be decreased, all other factors remaining equal.

-In what way does the Ma factor control contrast?

Ans-As the Ma factor is increased a and the KV factor correspondingly decreased , the contrast will be increased, all other factors remaining equal. As the Ma factor is decreased and the KV factor is increased , the contrast will be decreased, all other factors remaining equal.

-In what way do intensifying screens affect contrast?

Ans-The use of intensifying screens adds materially to the amount of contrast that may be obtained.

-In what way does the use of the Bucky, or of cones, affect contrast.

Ans By preventing a large % of secondary and stray radiation from reaching the film, the contrast is materially increased.

-Can the distance factor be used to control contrast?

Ans-The distance factor is not ordinarily used to control contrast, because it introduces changes in distortion and detail.

-Does altering the quality of detail affect contrast in any way?

Ans No.

-Does the quality or make of film affect contrast?

Ans-The quality or make of film does have something to do with the amount of contrast available, but this is not used to control contrast.

Ans-No. Any desired density may be obtained with any of the screens available at the present time, provided they are in good workable condition.

-Does secondary or stray radiation play any part in the control of radiographic density?

Ans-Yes.Radiographic density is under better control when a large percent of secondary and stray radiation can be eliminated.

* Does the Bucky or cones,play any part in the control of radiographic density?

Ans-Yes.Due to the fact that a large part of secondary and stray radiation is eliminated the density is under better control.

-In what way does the time of development factor control radiographic density?

Ans- Increasing the time of development increases the density and decreasing the time of development decreases the density,all other factors remaining equal.

-When is it advisable to use the time development factor to control radiographic density?

Ans-Only in case of an over-exposed film. By shortening the time of development in this case a more suitable density may be obtained.

-Does the temperature of the developing solution affect the radiographic density?

Ans-Yes,but it is not considered practical to change the temperature in order to control density.The temperature should be properly fixed before proceeding to develop the film.

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Cavity x-ray-ForGastro-intestinal work as oesophagus,stomach,small intestine,and the colon (barium sulphate) is used.

Genito-urinary (Neo-eopax)
Gall bladder (Iodikin)
Uterus and Fallopian tubes(Iodized oil)

To examine the oesophagus for pathology or for the presence of some alien body,mix a thick batter of barium sulphate,give the patient one teaspoonful,have him hold it in the mouth until the fluroscope is in position,then have the patient swallow the barium,observe its descent through the oesophagus -to the stomach.

It descends rapidly in the form of aball and in a stenosis or stricture the descent will be impeded.

Fish bone will bisect the barium ball,this can be marked on the patients throat.

The trachea is filled with air and foreifn object readily seen.

The Genito-Urinary Tract.

Iodized oil($cc's) is injected into the cervix of the uterus and spreads rapidly into the Fallopian tubese.If more is used it may be absorbed into the peri)toneal cavity and become a foreign body.The radiograph is taken exactly ten minutes after the last cc. has been injected into the uterus.It should be introduced slowly,but not over five minutes.

Most pathologies of these two organs are found as strictures in the Fallopian tubes.

Cancer and tumor have the same appearance as they do in any other part of the body.

-Genito-urinary tract (10cc of Neo-eopax) is introduced hypodermically in the median vein of the)left arm,which should be injected very slowly,and during the injection the patient will experience considerable pain in the left shoulder which soon leaves.

Wait five minutes and make the first radio-graph,a second in five min. and a third in fifteen min.and a fourth in thirty minutes.

*Stomach--Two glasses of barium sulphate solution is taken orally. One part of barium sulphate to ~~three~~ three parts water.The patient drink the two glasses and then radiographed in ten minutes and the barium will be well in the duodenal cap. Eighty-two percent of all stomach ulcers are found in the duodenum. If pathology is suspected in the fundus of the stomach,a second radiograph may be made,the patients pelvis and feet must be elevated forty-five degrees and heavy pressure applied in the area of the duodenum tt force the barium up in to the fundus.

)If the technique is riht,all factors being perfect,the lines of the greater and lesser curvatures of

Stomach

the stomach will be sharply out lined,provided the stomach is normal. If cancer is present in any portion of the stomach, the stomach will assume an hour-glass appearance,the stricture being in the site of the pathology.If ulcer is present there will be a V-or U- shaped indentation.If this is found,several other radiographs should be made, in order to establish differential diagnosis between ulcer and peristaltic waves which are sometimes picked up in radiography of the stomach and which present the appearance of ulcers.

Another means of ruling out ulcer is to place the patient under the fluroscope and attempt by pressure to force the barium into the V-shaped space,if the barium goes into and the V-shape straightens, ballons out,the operator knows that it is peristaltic wave rather than ulcer however if it remains constant an ulcer can be diagnosed.

A healed ulcer radiographically has the same appearance as an active ulcer,but if the ulcer is healed an aneurysm will be found directly opposite.This aneurysm is compensational. Extreme dilatation of the stomach is diagnosed by shadows which encircle the entire organ, giving the appearance of a halo.Emptying time of the stomach of the barium to pass through the pyloris into duodenum varies with people and should pay more attention to pathology. The fundus should be examined by a second x*ray. and seventy nine percent are missed.

The Colon--Two technics used I-orally and-2- per rectum.

Orally sixteen ounces should be taken mixed as in stomach examination and the radiograph made twenty four hours later.

Retention enema usually prefered with one quart of barium solution introduced in the rectum, thepatient instructed to lie on his back and the radiograph made,centering the beam on a level with the crest of the ileum to the center of the cassette.In the colon we look for spastic conditions,atonic conditions,loss of muscular tone,adhesions, and displacements of organs from normal,also for tumors,cancers or ulcers.A colon cancer appears to be a strictured area which has a fuzzy appearance.Instead of being sharply and well defined,the lines are ragged.An ulcer has the same appearance as in the stomach.,howeveran ulcer in the colon is difficult to diagnose because of the great amount of peristaltic action.The pathologist should bear in mind that because of its weight the opaque medium will distort a normal colon.As the barium is introduced in the rectum it flows rapidly to the right side,reaching the ileocecal valve in approximately two minutes provided no strictures have been encountered,this will give the ascending colon an atonic appearance,which should not be misinterpreted as pathplogy.Normally the descending or motor colon is an inch and a half smaller than the ascending portion.

Some operators take the radiograph with the patient lying face down on the table,holding the breath during exposure another on back and another standing.Face down the beam is centered one and a half inches above the sacrum,on back between the anterior-superior spines of the ileum and standing the same land marks as in the prone position.

Gall Bladder-Iodikin or any other standard dye is given orally at 8 o'clock at night.The patient is permitted to eat supper but at the x-ray lab. next morning at 7 o'clock without breakfast. and make sure the patient has not taken,food,drink water or even smell food from taking iodikin to seven in morning.Some times it is necessary to take as many as a dozen radiographs to pick up the infiltrated gall bladder.The necessity of staying away from food cannot be over emphasized.

The patient is laid on his back on the bucky,the beam is centered over the middle of the lower rib two and one-half inches away from the median line.The KV,Ma,distance,and time factors must be perfect,in order to make this radiograph.The presence of stones in the G.B. is easily detected,They show up as dark,round or irregular shaped objects. Stones comprise the majority of gall bladder pathologies.

Bowels should be irrigated to prevent the hepatic flexure of the colon from superimposing the gall bladder.If no stones are indicated,the operator should instruct the patient to go eat a butterfat breakfast and return in one hour for another radiograph.If the second radiograph reveals that fifty percent or more of the iodikin has passed, the gall bladder is normal in function and is not inflamed.If less than 50% has passed,adiagnosis of inflammation of the bladder is indicated.

Sinuses--The patient is placed face downward on the table,the chin and nose placed against the cassette,with the forehead slightly up. The beam is centered approximately in the middle of the occipital bone,making a direct beam from that point to the middle of the fore head.The antrums are radiographed with the patient's forehead against the cassette,the chin and mouth slightly up.The beam is centered straight through the skull to the antrums.The patient lies face down on the cassette for ethmoid with the mouth open as far as possible. The beam is centered through the skull to the open mouth. In radiographing the sinuses considerable KV must be employed. To penetrate the heavy occipital and parietal bones the tube should not be angled but rather the beam directed on as near a straight line as is possible from one point to the other.Angling the tube invites super imposition.If the sinuses are normal they present a clear,well defined area.If infected,dark areas caused by the accumulation of pus which is opaque to the rays,will be presented.

Mastoid--To radiograph the mastoid,the ear is taped forward away from the mastoid to be x-rayed.The patient lies on the side,with the part to be radiographed or x-rayed against the cassette.The beam is then centered one inch above the opposite mastoid and one inch posterially, the tube being angled five degrees towards the feet. If the mastoid is normal it presents a honeycombed picture.If it is abnormal,areas of occlusion will be seen,this being caused by the accumulation of pus in cells.The normal mastoid cell is apparent but if it is pathological it is obliterated.

Lungs--In radiographic examination of the lungs,the standing position is used.The patient strips to the waist,hooks his chin overthe cassette holder,and stands as close as possible to the cassette. The hands are placed on the hips and the elbows are rotated forward. This is done to prevent superimposition of the scapulae on the film. This radiograph is made in fast time,to take out the heart shadow. The kilo-voltage should be sufficient to penetrate the heart muscle in the diaphragm.A radiograph of the chest in which the vertebrae of the dorsal spine can be seen,is undershot and is not diagnostic. The most common pathology sought in chest examination is tuberculosis.A tubercular lung appears as if the examinating physician were looking at a normal lung through a heavy snowstorm. Tubercular pathology is most generally found in the apeces of the ~~lu~~ lungs.

The Spine-- Radiographic examination of the spine is made in two positions,either standing or lying down. The beam,of course, is centered upon the suspected area,this being centered to the middle of the cassette.The patient is always placed with the spine against the cassette,all spinal radiographs being made from anterior to posterior Atlas and axisthe beam is centered through the mouth to get the first three bones and the second with mouth closed,head tilted back to and centered over the ponum adami.Dorsal spine beam on suspected area and lumbar and pelvis taken anterior to posterior with beam centered over umbilicus.Pathologies sought for are subluxations,osteomyelitis, tuberculosis(which appears as aU-or V shaped vertebrae as in an ulcer) hypertrophic and atrophic arthritis.If a large bucky is used for entire spine,the beam is centered to the middle of the dorsal spine. Used by basic technicians for contour rather than specific pathology.

I-Electricity

A.-A current or substance composed of electrons flowing in one direction

I.-Electron-The minutest amount of electricity.

2-Volt-The unit of pressure or force. One volt will produce a current of one ampere against a resistance of one ohm.

3-Ampere-The unit of volume or intensity.

4-Ohm-The amount of resistance offered to an electrical current.

A-Ohm's Law. Amount of current in amperes is equal to volts divided by resistance in ohms.

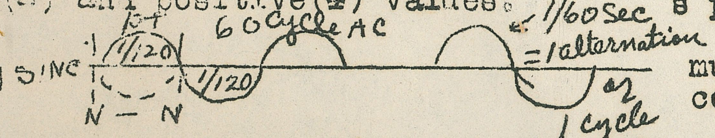
5-Watt-Unit of electrical energy in a circuit.

Voltage times amperage equals wattage (IOv timesIO amps= watts)

746 watts equals one horsepower.

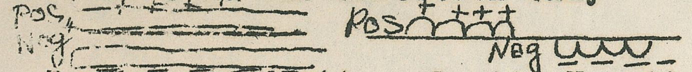
II-Alternating current(Sinusoidal)

A-Definition. An electric current which reverses itself and has neg. (-) and positive(+) values.



III. Direct current(Unidirectional) (Galvanic)

A.Flows in one direction only



B. Has a definite polarity.Negative or positive.

C.Chemical action

IV-Electrotherapeutic currents.

A-Sinusoidal.

B- Galvanic.

C-Faradic.

V-Therapeutic and Physiological effects.

1 A-Mechanical(faradic,sinusoidal and interrupted galvanic)

I-Produce muscular contractions.

B- Chemical (galvanic)

I-Negative or positive effects (Ionization)

2- Uv radiation(Vitamin D,pigmentation)

C- Stimulation(sinusoidal,uv, faradic).

I-Muscular activity.

D-Psychological-

E-Thermal(diathermy)

I-Hyperemia- detoxifies.

VI- Faradic current(Mechanical)

I- An alternating induced current of high voltage and low amperage.

2-Alternations are very rapid

3-Muscular contractions constant due to rapidity of alternations(100 per sec).

4-Interrupting current produces (vigorous) contractions and relaxations.

5- Uses of faradic current.

a-muscular degeneration)

b- muscle atrophe)

a and b paralysis

c-stimulative bath(electrode on feet and back in bath tub)

d- fallen arches

e-test reaction Of degeneration

VII-Sinusoidal current

I-An alternating of variable voltage and milliamperage having no polar effects but having mechanical action(muscular contractions)

2-Frequency of alternation varies from 50 to I000 oscillations per second.

3-5-20 surges required for muscular contractions(separate contractions produced)

4-Contractions increased up to 2.000 oscillations,oscillations beyond this cause muscles to become tetanic or held in constant state of contraction(fatigue)

5-Physiological action (general)

A-Muscular stimulation (exercise)

a-contractions not to exceed IO-I5 per minute. Relaxation to permit recovery of -cells for following stimulus -(constipation,paralysis)

B-Muscular Inhibition

a-Rapid alterations(not less than 3500per min)not permitting muscular relaxation between alterations.

b- nerve supply to muscle becomes exhausted(rest results)

C-Circulatory effects

a-Nutritional effects increased.

b-Blood and lymph supply increased

D-Elimination

a-muscular stimulation (atony)

b-respiration(co2) decongestion

Note --interruptions should be of such frequency as to allow for complete relaxation of muscle and for muscle cells to recover for next stimulus.

6- Sinusoidal current characteristics.
  A-Rapid sinusoidal
    a-constantly reverses itself plus to minus.
    b-produces nerve exhaustion. (insuficient time for cells to recover)
    c-used chiefly for inhibition.
  B-Slow sinusoidal(galvanic sinusoidal)
    a-polarity reversed with each sine.
    b-produces muscle stimulation (striated and non-striated)
    c-atonic nerves or nerve exhaustion
    d-used chiefly for muscle stimulation
  C-Interrupted Rapid Sinusoidal
    a-Reaches its peak abruptly and drops.
    b-Is interrupted at definite intervals.
    c-Powerful muscular stimulation (striated,abdominal)
    d-Regeneration of nerve function
  D-Pulsating Galvanic Sinusoidal (Important)
    a-Each impulse pulsates.
    b-Stimulates surface mechanical vibration.
    c-Each pulsation causes a sudden interruption of the galvanic current
    d-Massage of deep structures.
    e-Used in G. I. tract (ptosis of atonicity,constipation)
  E-Surging Rapid Sinusoidal
    a-Intensity increases and causes surge.
    b-Uses-abdominal adhesions,preceded by diathermy,regeneration of impaired nerve function.
  F-Rapid Sinusoidal Wave Sustained Peak.
    a-5-45 pulsations per minute.
    b-Has push and pull effect.
    c- Adds tone to muscles and nerves.
    d-Uses- coloptosis,sluggish muscles
  G-Oscillatory Waves
    a-5-45 pulsations per minute
    b-Polarity reverses itself 680 times per second accompained by rest period.
    c-Plus I/i360 of a second(on pos)
      Negative I/I360 of a second(on negative position)
      O (rest) I/I360 of a second
    d-Uses-in place of surging rapid sinusoidal (no sting) abdominal adhesions.
  H-Oscillatory Wave Sustained Peak
    a-5-45 pulsations per minute
    b-Produces a long strong muscular pull.
    c-Very little skin sensation
    d-Uses- coloptosis, intestinal stasis.
  IInterrupted Oscillatory Waves
    a-Polarity reverses 680 times per second
    b-Positive direction I/I360 sec.
    c- Negative direction I/I360 sec
    d-Has little shock effect, no skin sensation.

VIII-Galvanic Electricity
  I-Definition, A direct current having definite polar(neg and pos) effects and produces chemical action.
  2-Dissociation
    A-Chemical substances going into solution dissociate into two atomic groups(negatively andpositively charged ions)
    Example-NaCl plus H_2O equals
    plus Na ions
    neg minus Cl ions
  3- Ionization
    A-Definition-breaking up of a compound into negatixe and positive ions and driven into the body tissues by means of the galvanic current. phoresis-
  4- Anions
    a-Negatively charged ions Attracted to positive pole,repelled by negative pole.
    Anaphoresis.
    Example- NaCl solution Na plus to negative pole
    Cl (minus) to positive pole
  5-Cations
    a-Positively charged ions-attracted to negative pole and repelled by positive pole.
    (cataphoresis)
    Example-Zinc sulphate solution positive zinc ions repelled by positive pole and driven into tissues.
  6-Physiological effects of galvanic current
    a-Muscular contraction(stimulation,exercise)

7-Therapeutic effects
a-Chemical(germicidal)
Changes tissue reaction acid-alkaline
IX-Pole Characteristics
A-Positive Pole
I-Attracts acid and repels alkali
a-Renders tissues acid by attracting oxygen
~~2~~-b-Sedative
A-Local acid reaction of tissues acts as anodyne
3-Relieves pain (anodyne)
A-Oxygen accumulates around positive pole, acid reaction.
4- Vaso-constriction
a-Produces ischemia by lessening calibre of blood vessels.
5-Hemostatic
a-By virtue of vaso-constriction
6-Hardens tissue
a-Coagulation of albumin due to acidity.
7-Ionizes metals and alkalines
8-Adheres to tissues
B-Negative Pole(alkiline)
I- Attracts hydrogen to adjacent tissue rendering them alkaline.
2-Increases pain.
3-Vaso-dilator-increases lumen of blood vessels
4-Softens tissue
5-Stimulative-nerve endings
6-Ionization-acids
C-Therapeutic application of positive pole
I-Infections
a-Sinuses--b-Otitis media--
c--Indolent ulcers
2-Zinc Sulphate ~~Sulphate~~Solution
I-2%
A-Action
(I)-Free ions of zinc form as insoluable protein precipitate.
(2)-Germicidal in effect and penetrates tissues.
(3)-Devitalization of tissue
(4)-Slough results
(5)-Formation of healthy tissue (granulation)
3-Copper Sulphate -I-2% solution
A-Indications
(I) Non healing wounds.
(2) Ulcers.
(3) Endocervitis
b-Action
(I) Antiseptic ions of cu introduced
(2) Penetrates and becomes infiltrated into tissues.
(3) Chemical destruction of superficial tissues
(4) Granulation tissue results
4-Magnesium Sulphate 5% solution epsom salts
a-Indications
(I) Localized edema(sprains
b-Action
(I)-Disperses fluids
-5-Mecholyl o.5% solution
a-Indications
(I) Arthritis- Raynaud's disease~~b-Action--~~
~~-b-(I-)~~Action
~~b~~-(I)Stimulates parasympathetic nerves
(2)Dilates peripheral vascular system.
(3) Increases metabolism
(4) Increases pulse rate
(5) Produces perspiration
(6) Flushing, salivation, peristalsis
(7) Goose flesh
c-Technique
(I) Saturate suitable size asbestos paper in solution
(2) Wrap around affected ~~are~~ area.
(3) Cover with suitable piece of(bl) tin, spiral I/2''apart, no metal touching skin.
D-Therapeutic application of negative pole.
I-Sodium of potassium iodide
I-2% solution
a-Indications
(I) Goiter (hypothyroid)
(2) Dermal scars
(3) Scleroderma
b-Action
(I) Liberation of free iodine in tissues
~~2--(2)~~-3 Sodium Salicylate
a- Indications
(I) Rheumatism
b- Action
(I) Salicylic acid introduced into tissues.
c-Tendency to neutralize tissues.
d-Increases metabolism
e-Antiseptis properties
3- NaCl Solution
a- Indications
(I) Superficial scars
b-Action
(I) Chlorine ions liberated and form sodium hydroxide
(2) Softens and dissolves scar tissues.

c-Duration of treatment
(I) Strength of current
(a) Comfortable tolerance 2-30 ma
(2) Time
(a) Depends on solution 5 min to 30 min.

X-Galvanic Currents
A-Straight Galvanic
I- Alterating changed to direct by cu oxide rectifier- passes thru choke coil and condenser-filter circuit- ripples and pulsations removed
2-Uses
a- Ionization, electrolysis
B-Galvanic Wave
I-Pulsations 5-45 per min
2-Pulsations regulated by frequency selector.
3-Has some chemical action
4-Used for treating adhesions with scar formation.
C-Galvanic wave Sustained Peak
I-Current rises rather abruptly and held or maintained at maxium for I/2 of wave or peak.
2-No interruption or rest period between waves.
3-Has polar or chemical action
4-Uses-Atonic G. I. tract with muscular degeneration.
D-Interrupted Galvanic
I-Current rises abruptly from zero and falls abruptly.
2-Definite rest period between interruptions.
3- I0 to 90 interruptions per minute.
4-Definite polar effects
5-Uses-Reaction of degeneration and muscular stimulation.

Information-The National Council of physiotherapy at the end of our year in June will hold a symposium and issuing a Certificate of Attendance but before it is received an examination will be given to test our knowledge gained in these courses and operative efficiency in physiotherapy therefore regular attendance and strict attention should be given. There will be six meetings per year counting to 30hour credit.

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